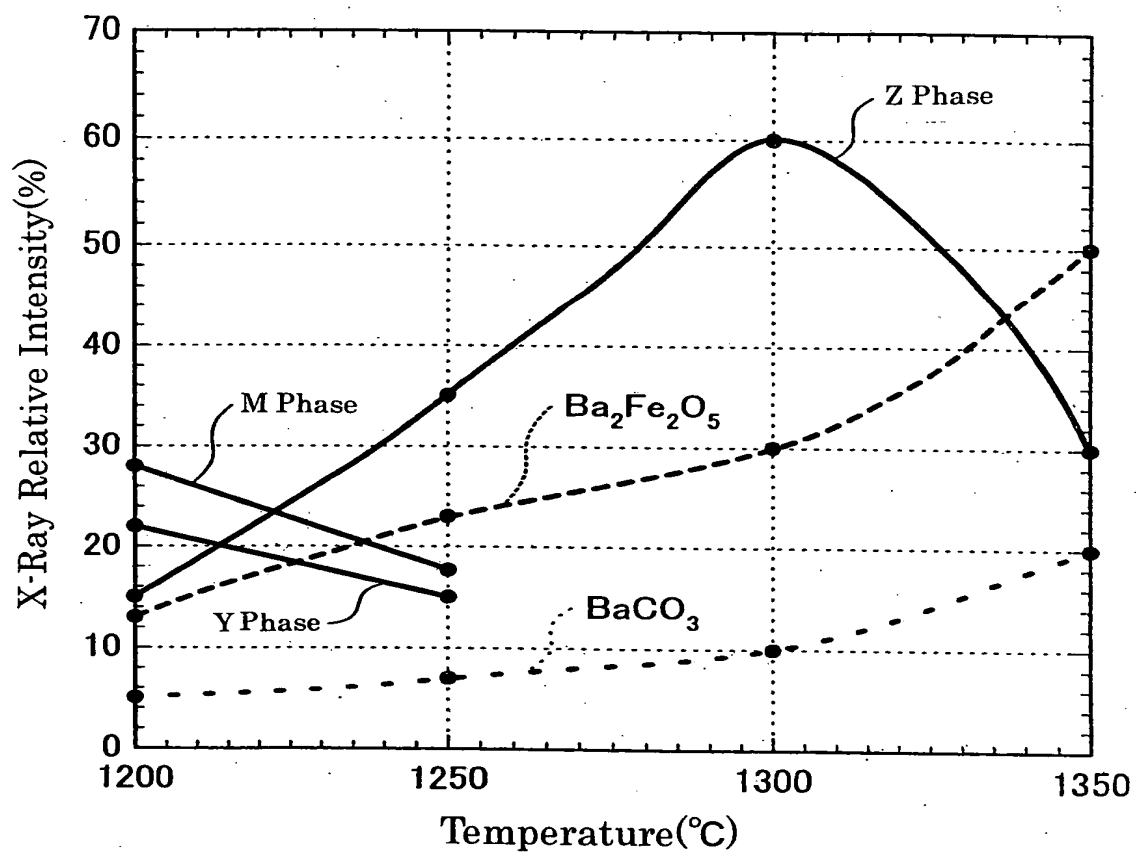


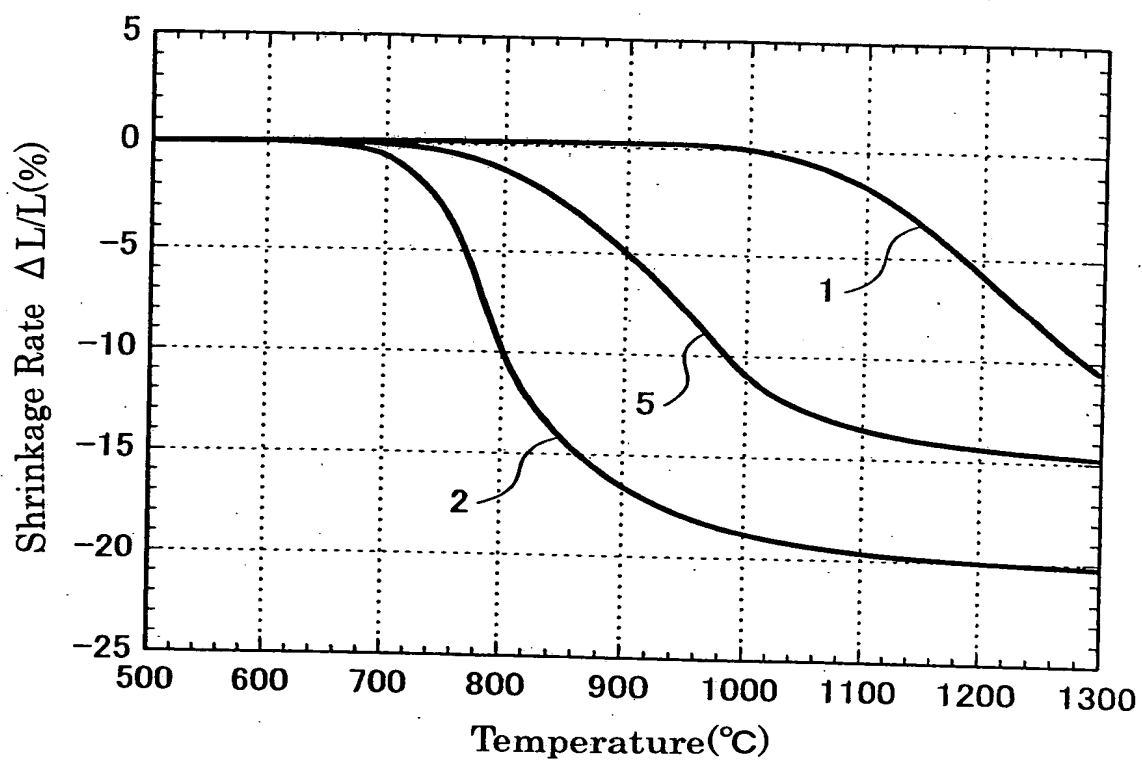
1/45

FIG. 1



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FIG. 2



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FIG. 3

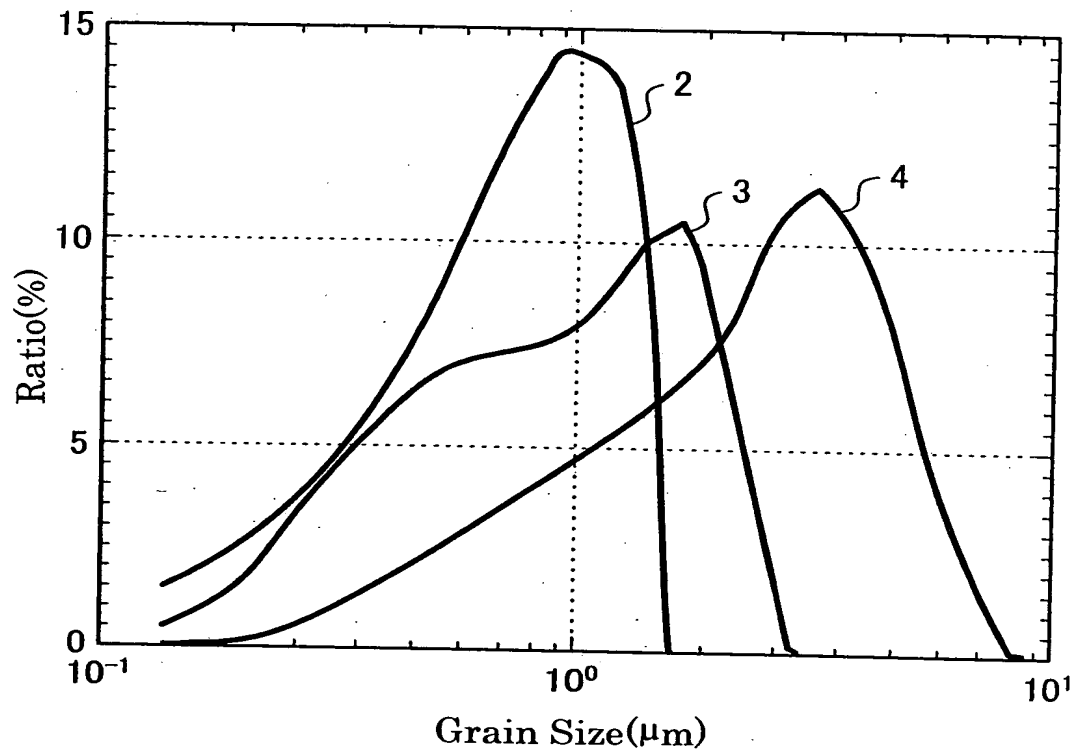
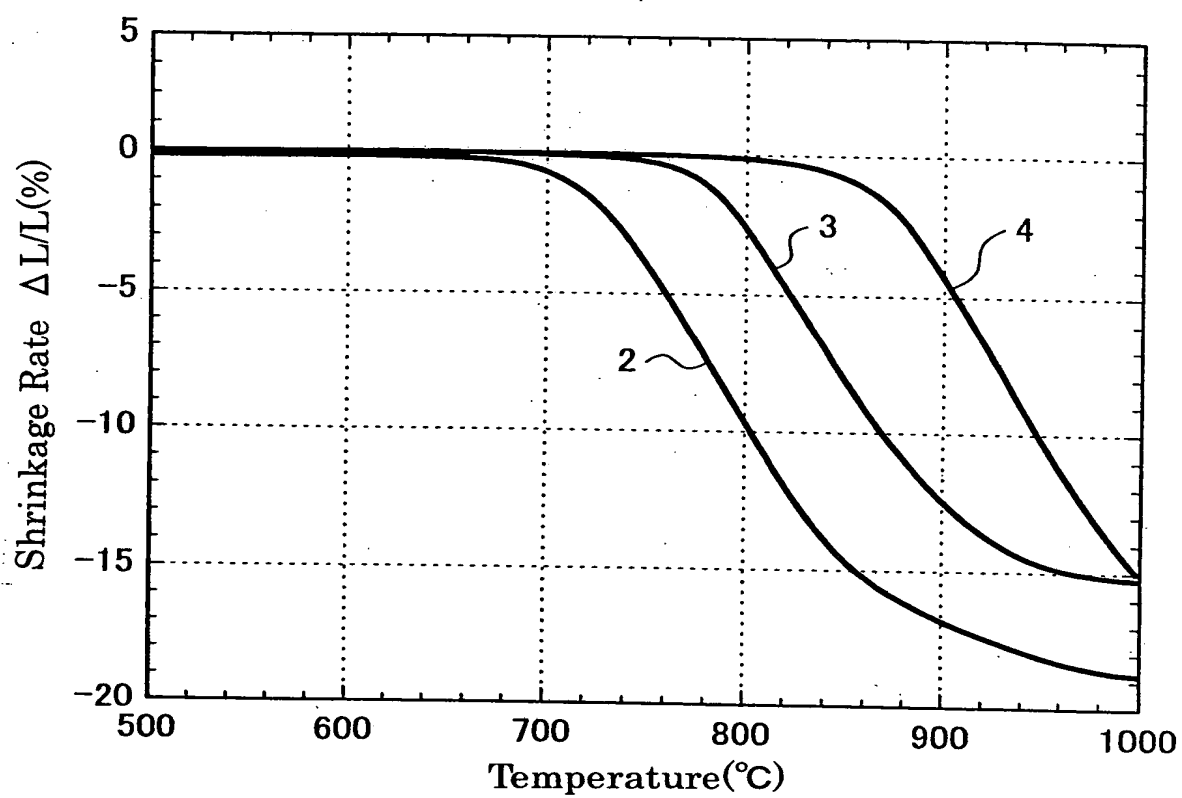
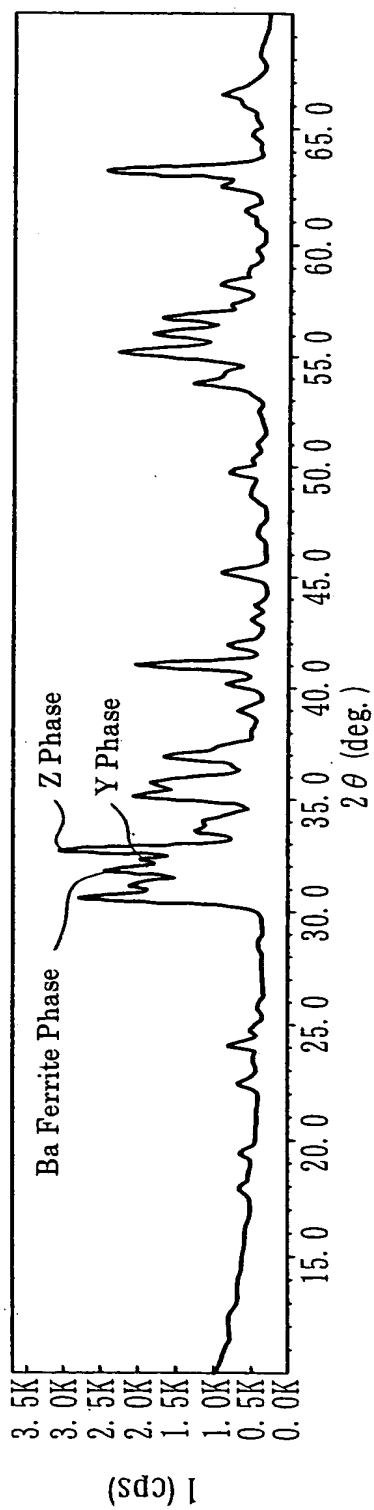


FIG. 4



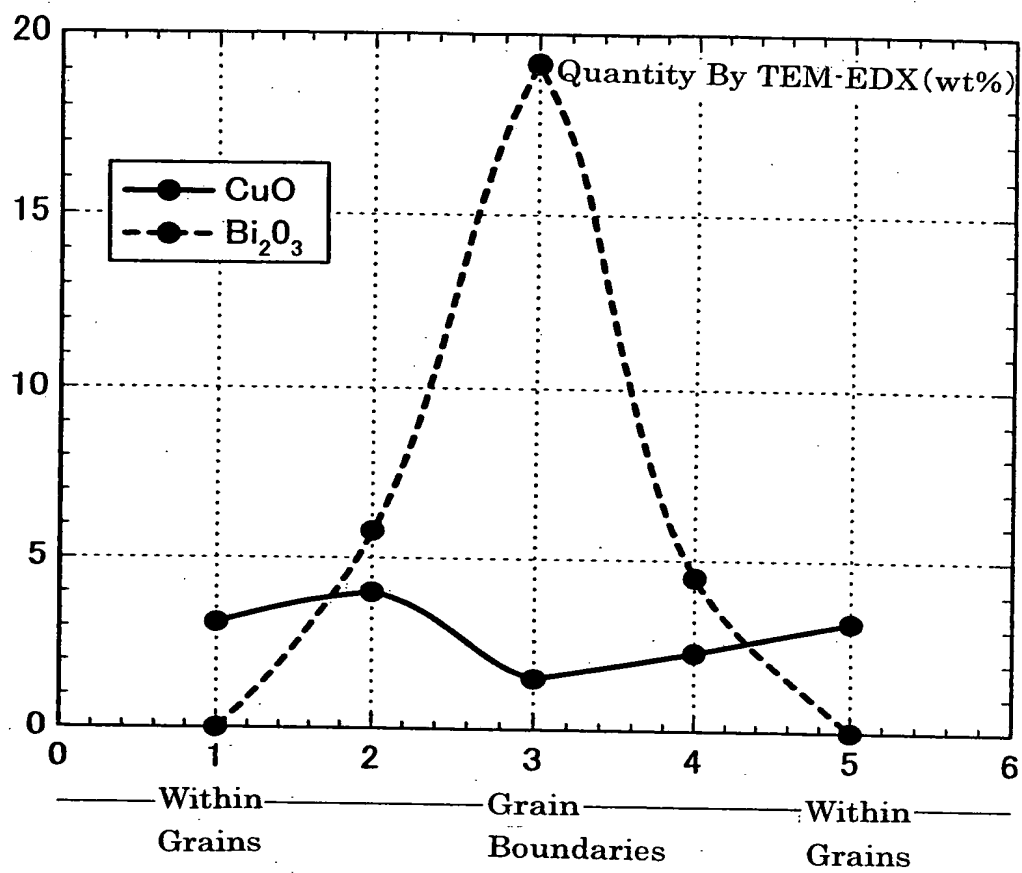
5/45

FIG. 5



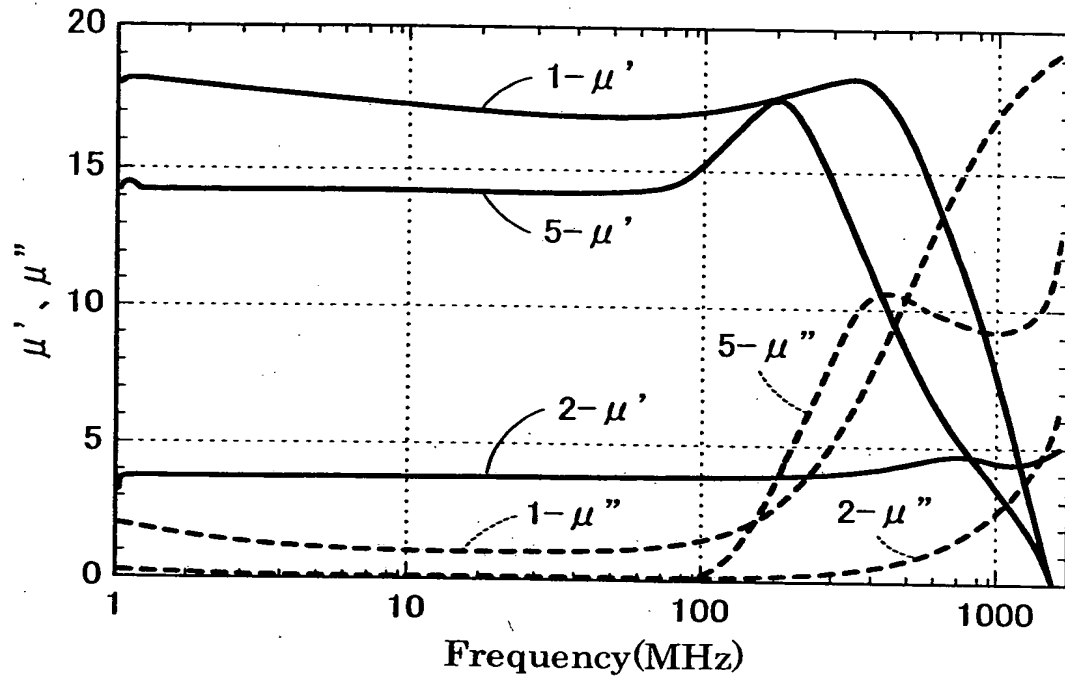
6/45

FIG. 6



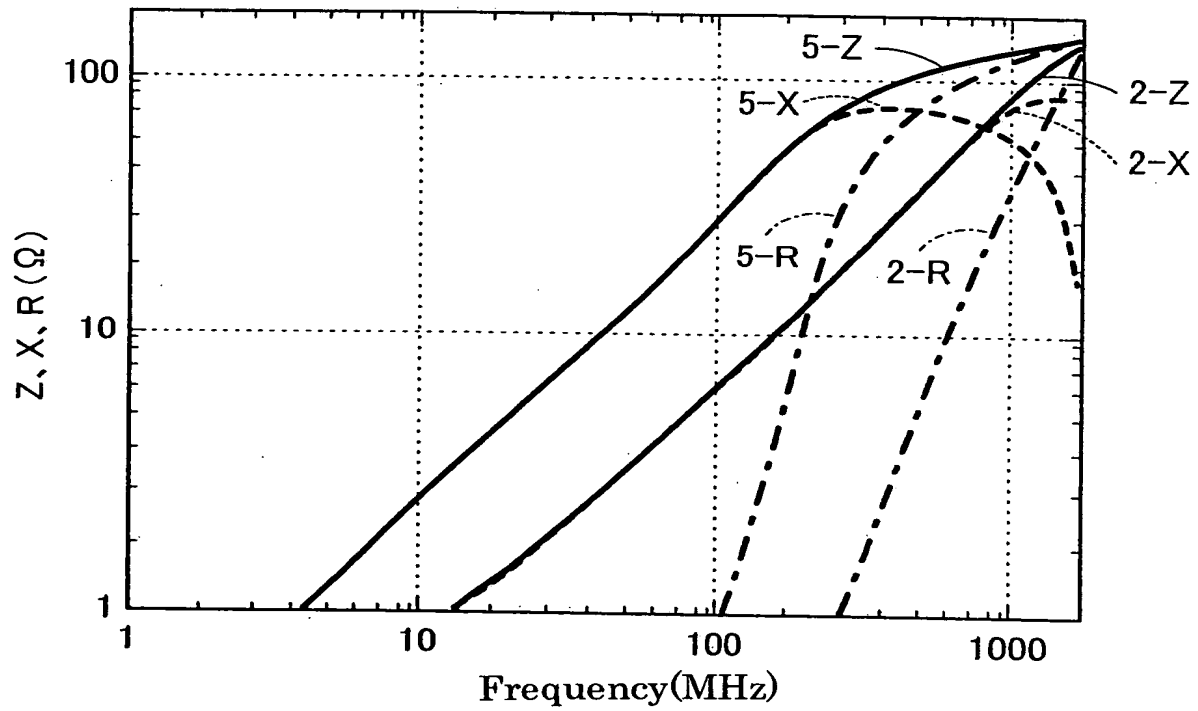
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FIG. 7



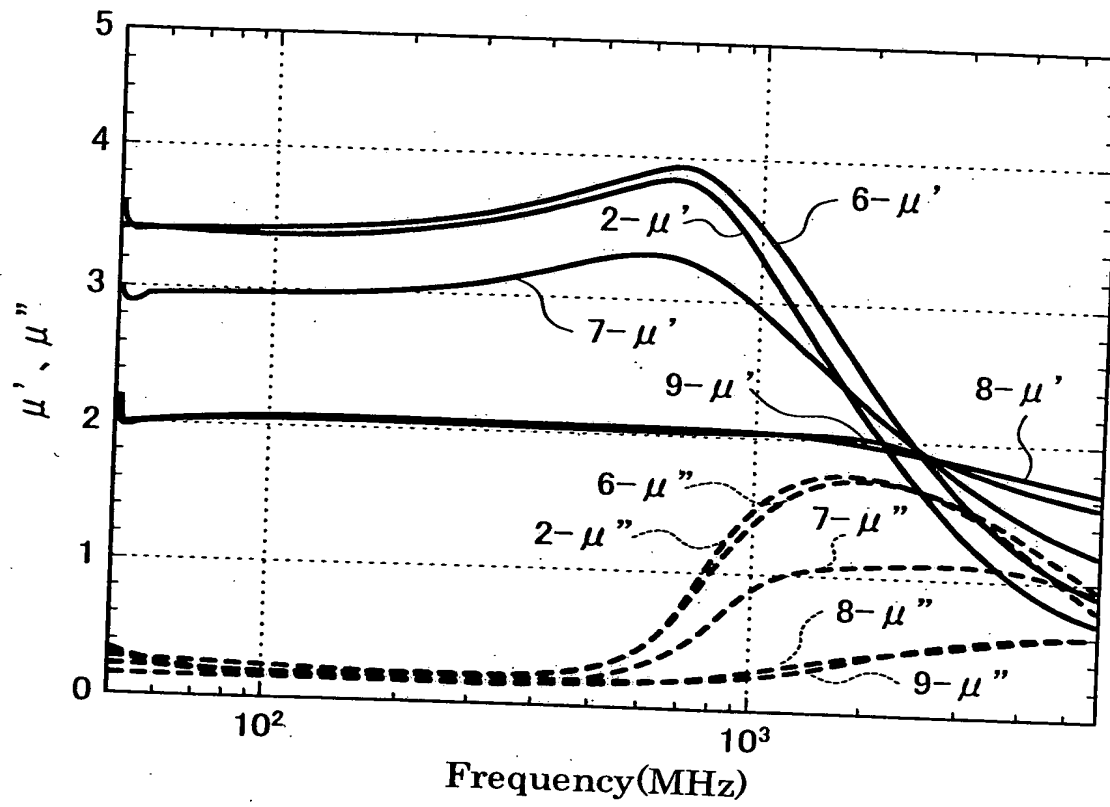
8/45

FIG. 8



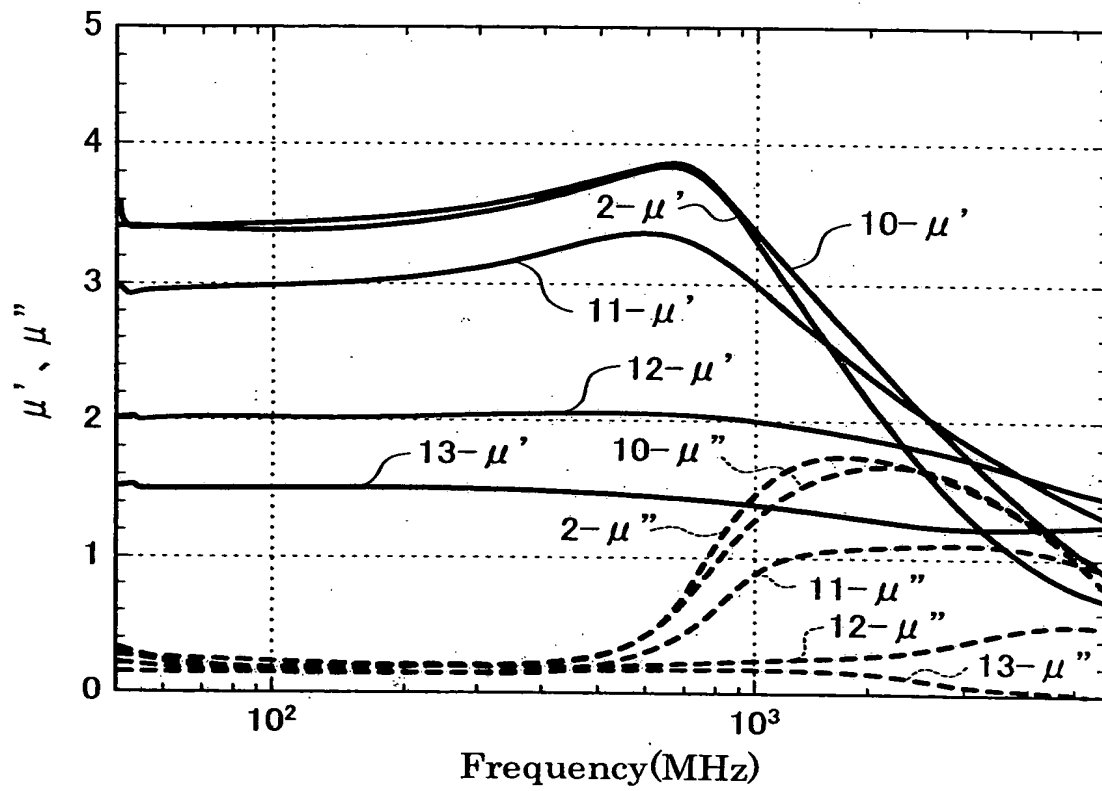
9/45

FIG. 9



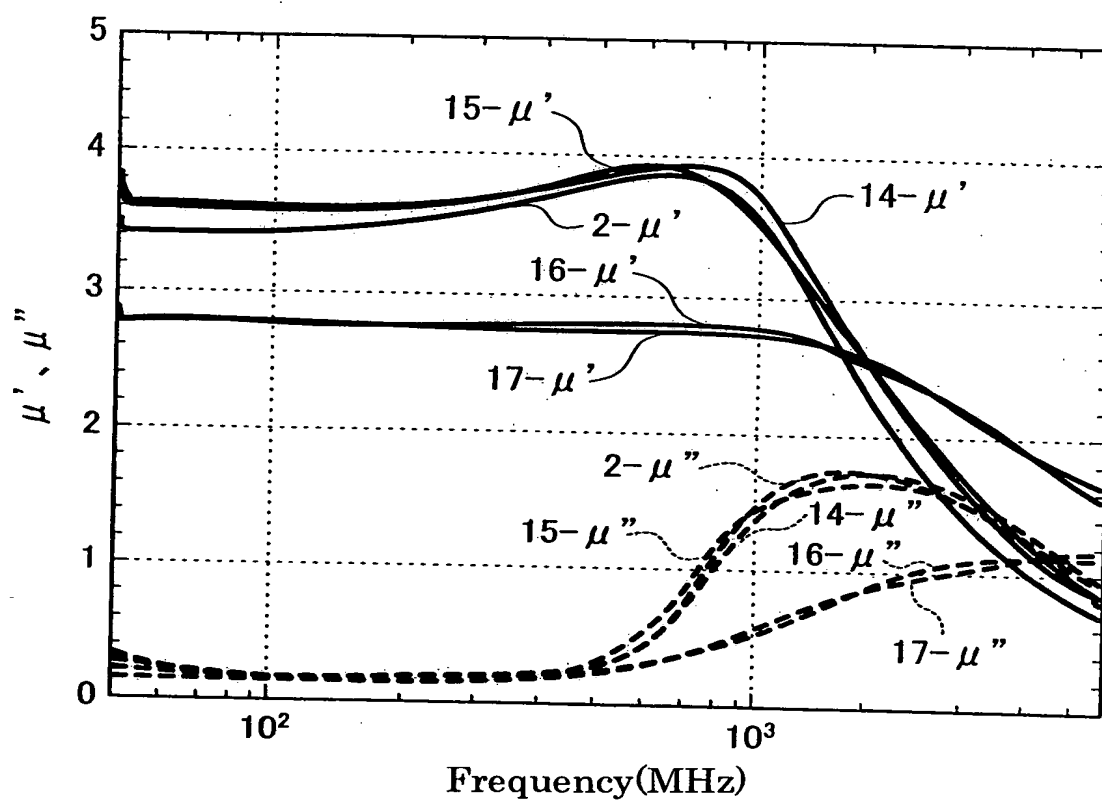
10/45

FIG. 10



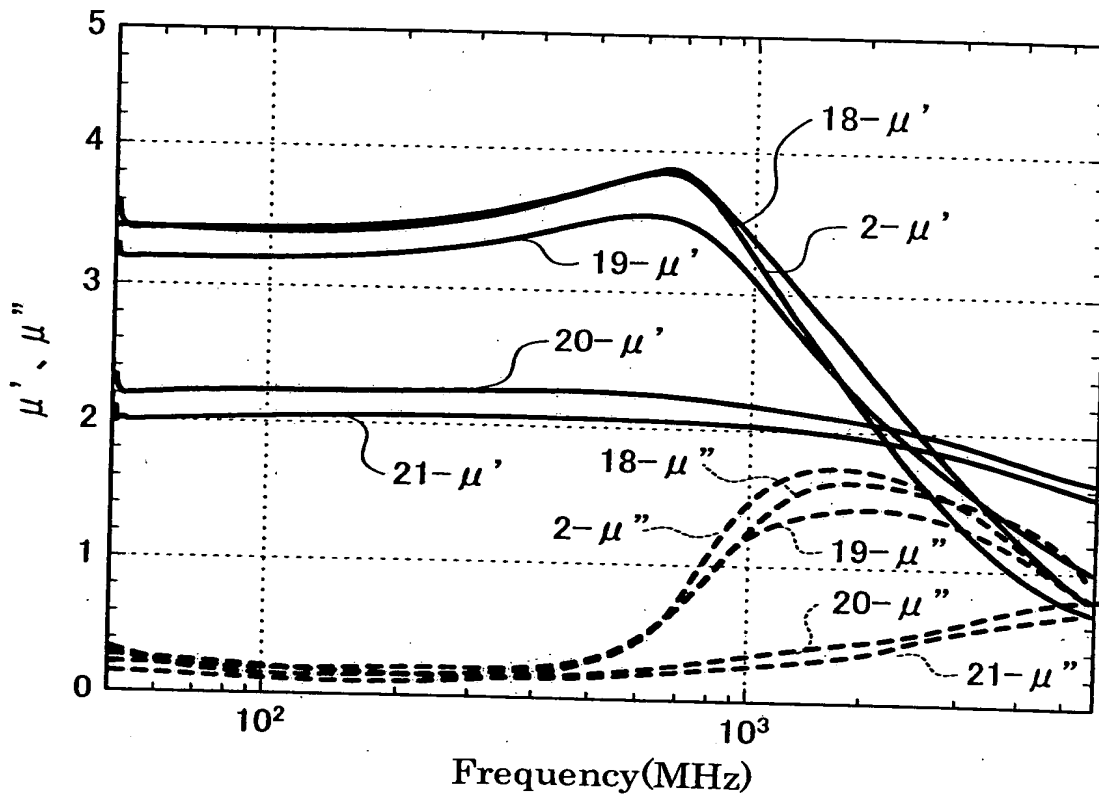
11/45

FIG. 11



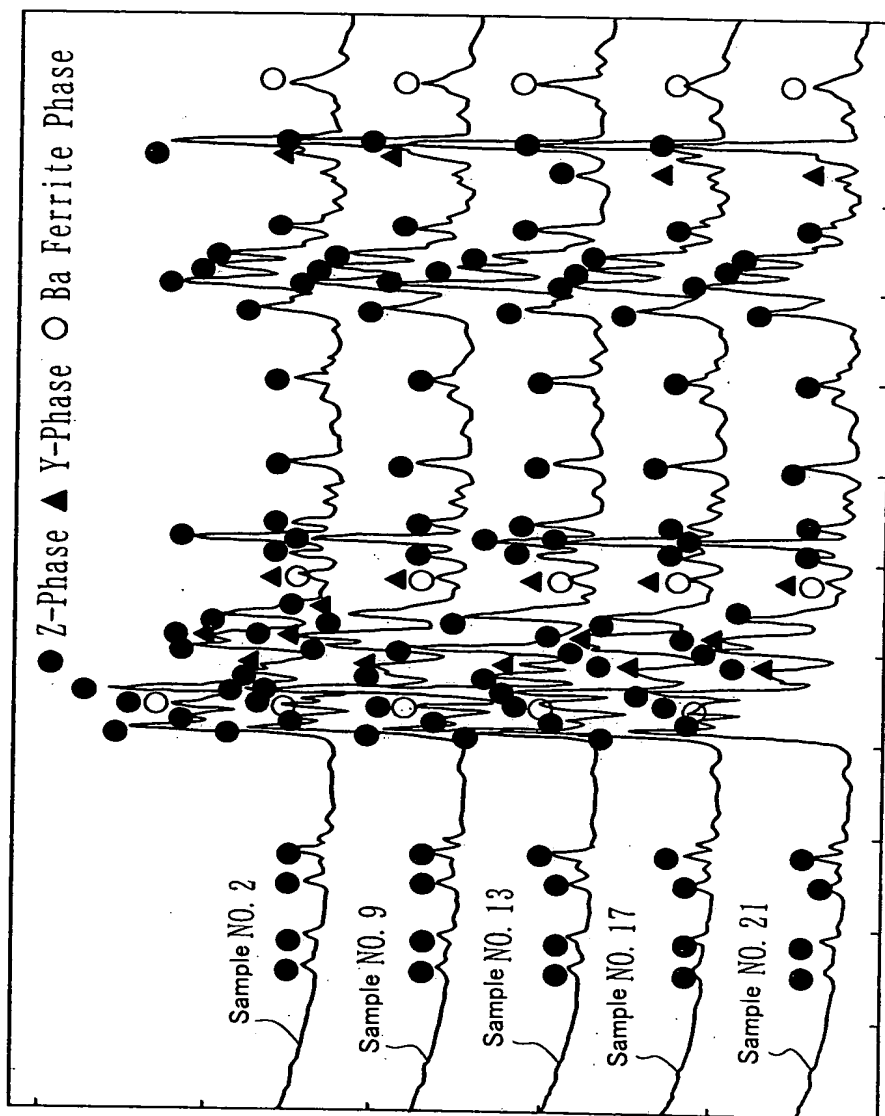
12/45

FIG. 12



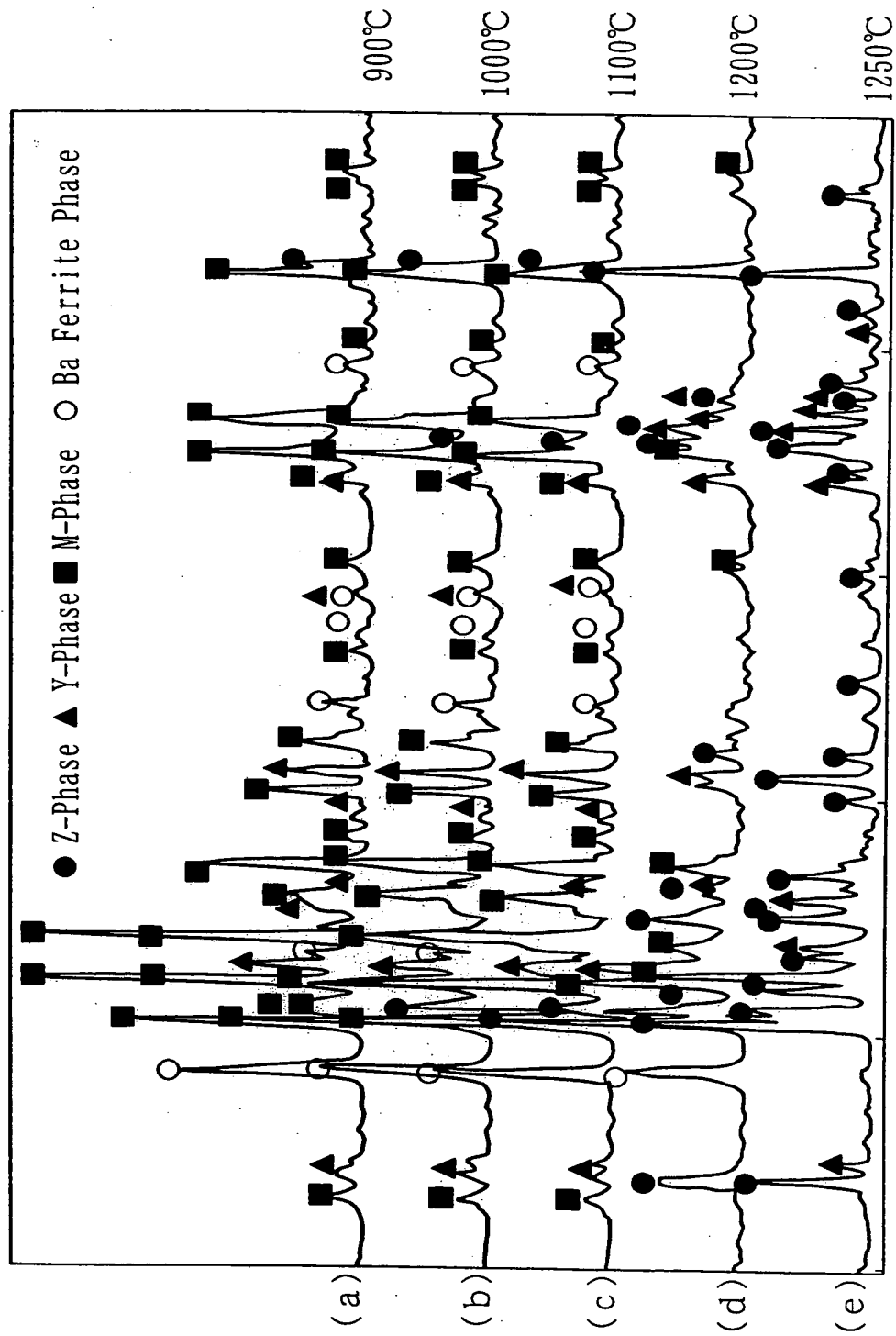
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FIG. 13



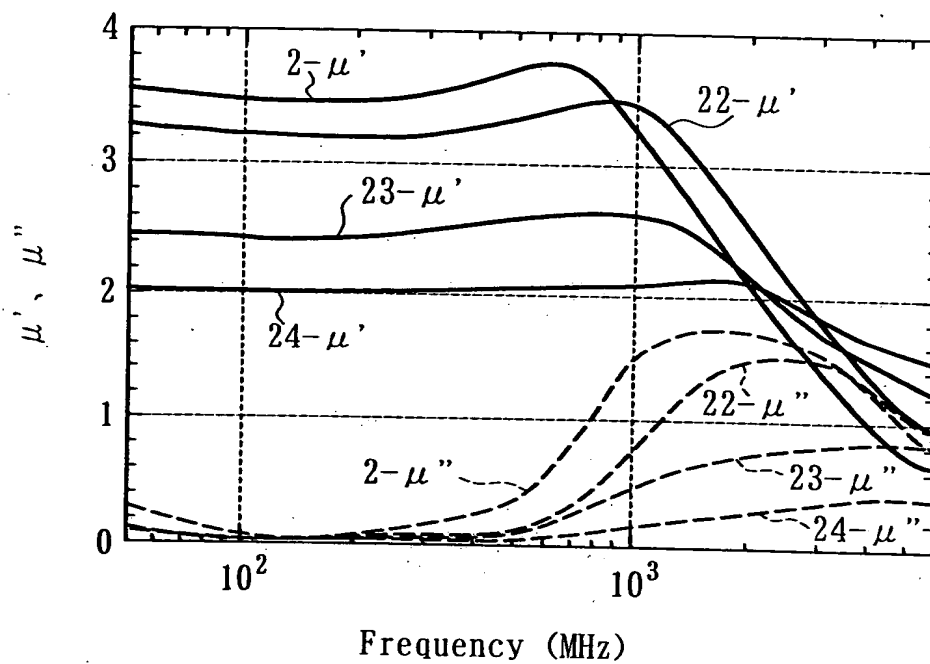
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FIG. 14



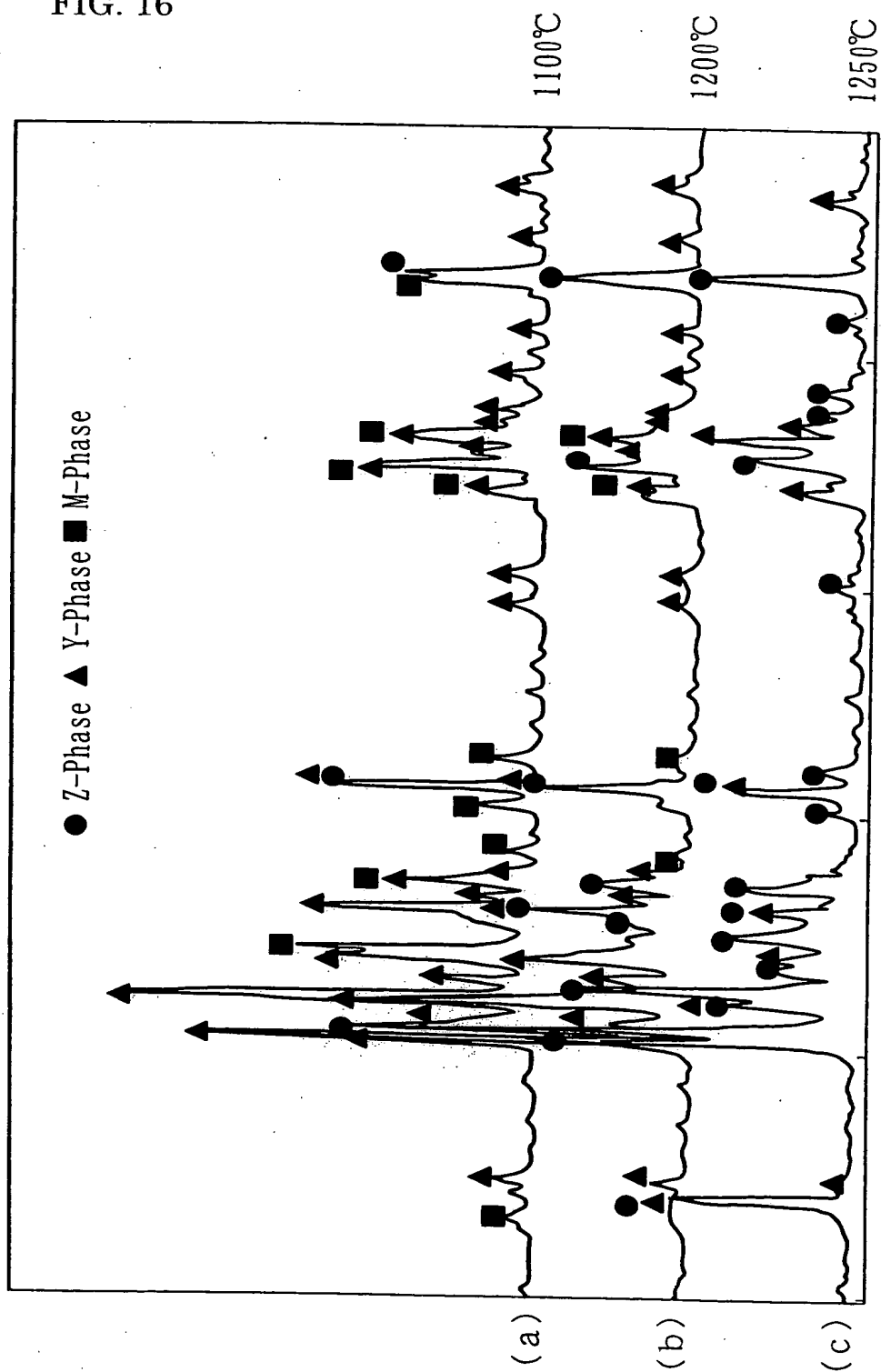
15/45

FIG. 15



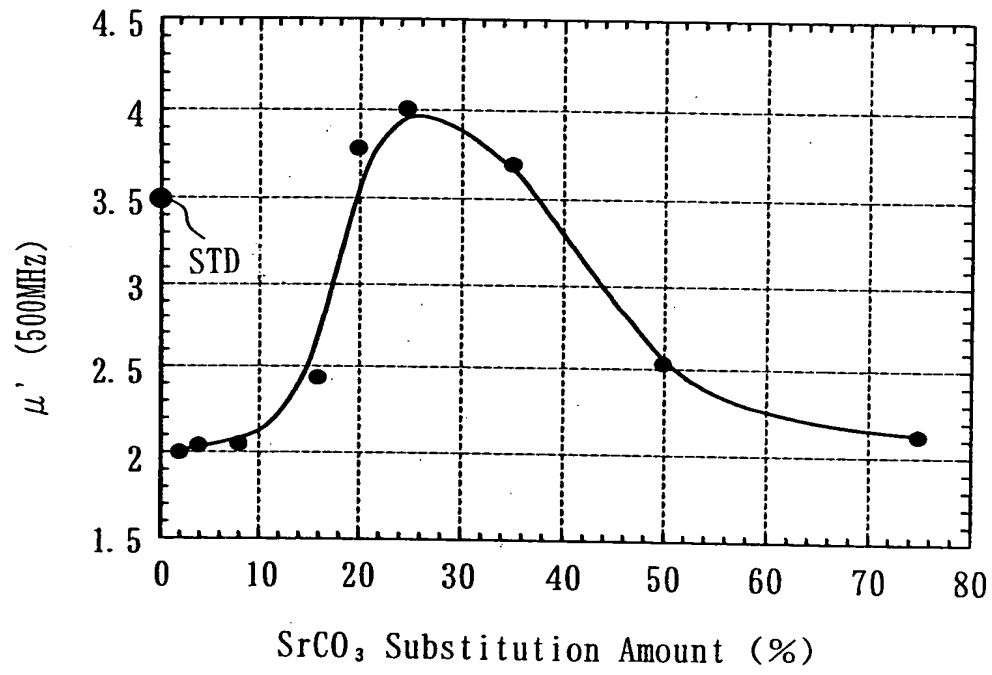
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FIG. 16



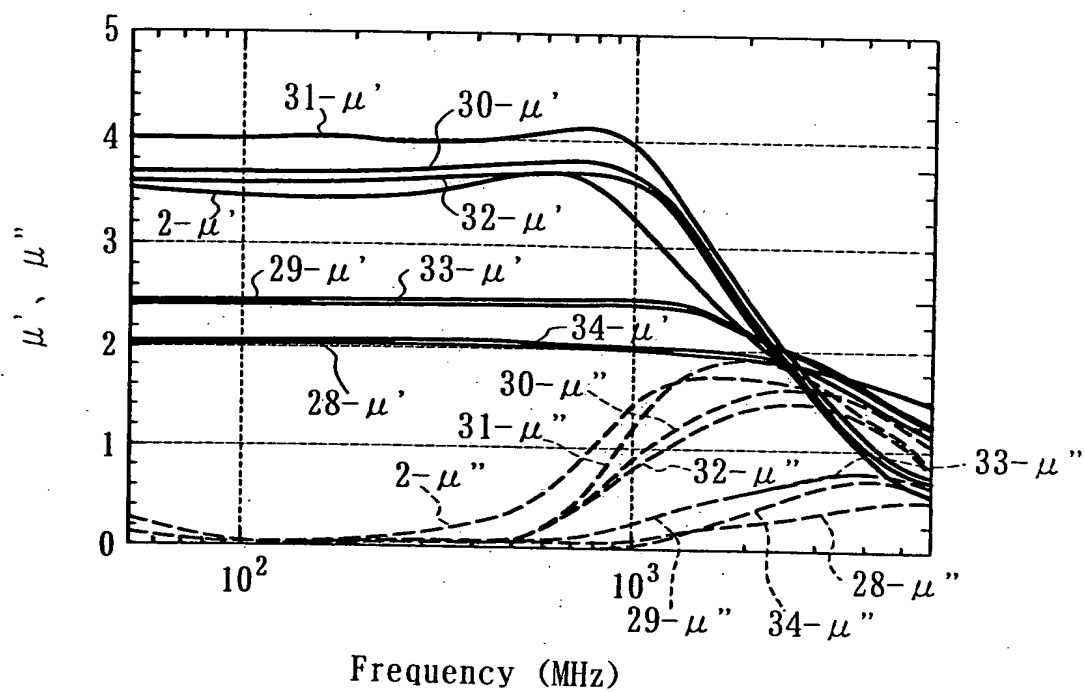
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FIG. 17



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FIG. 18



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FIG. 19

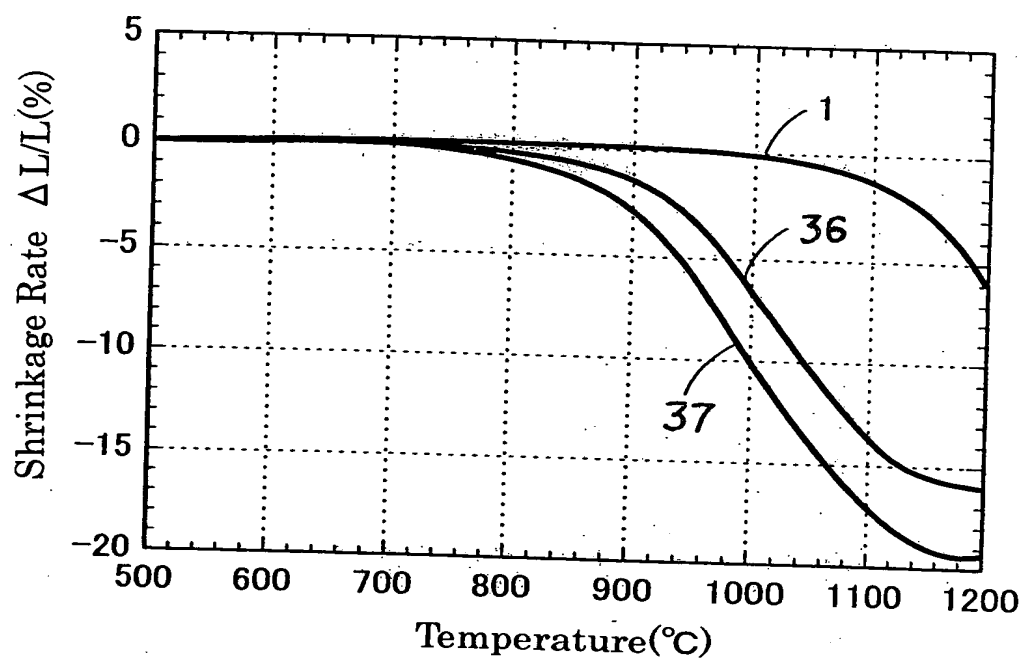
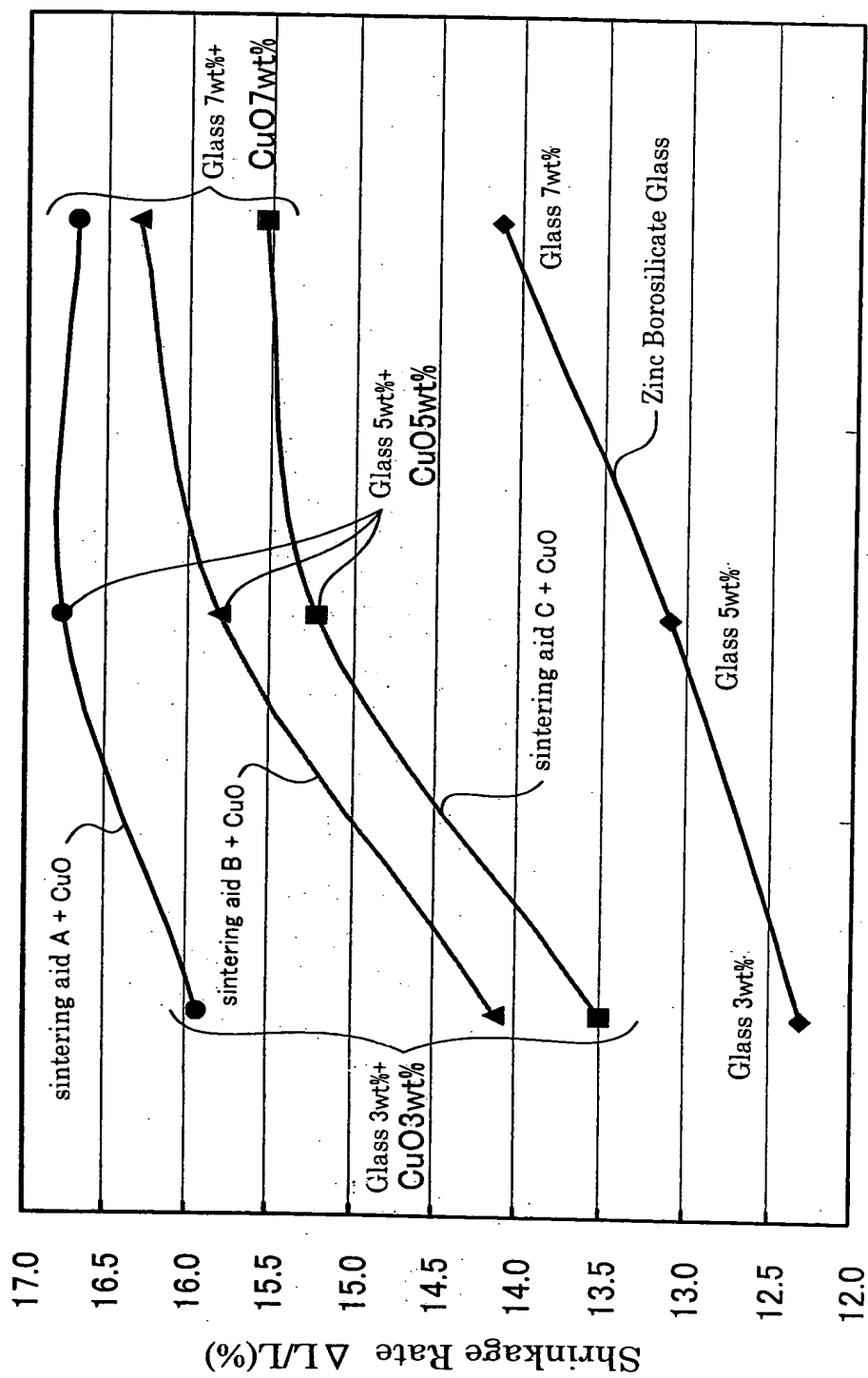


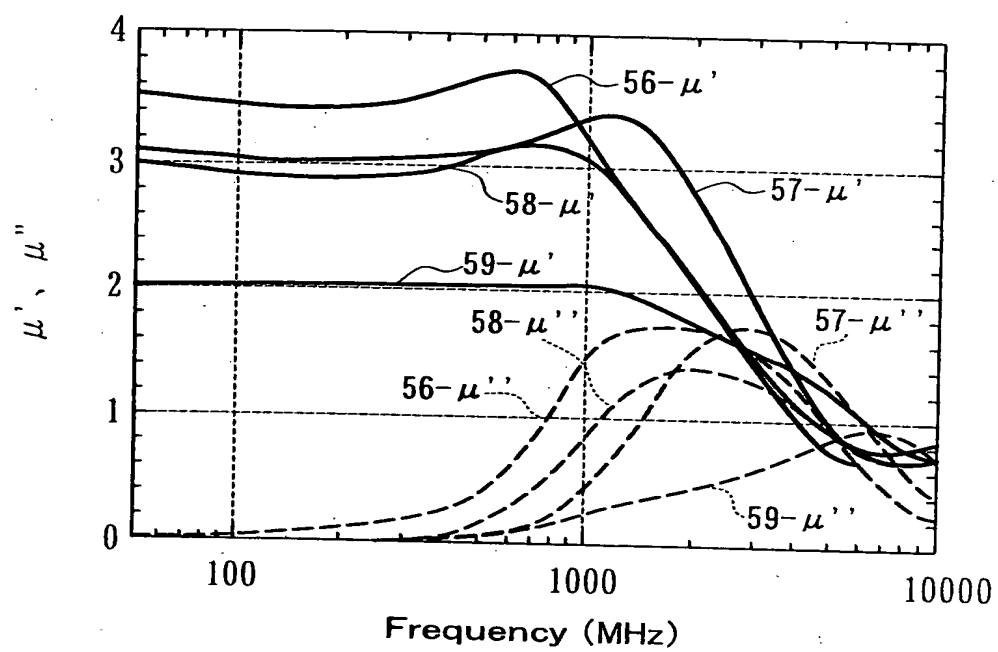
FIG. 20



Added Amount(wt%)

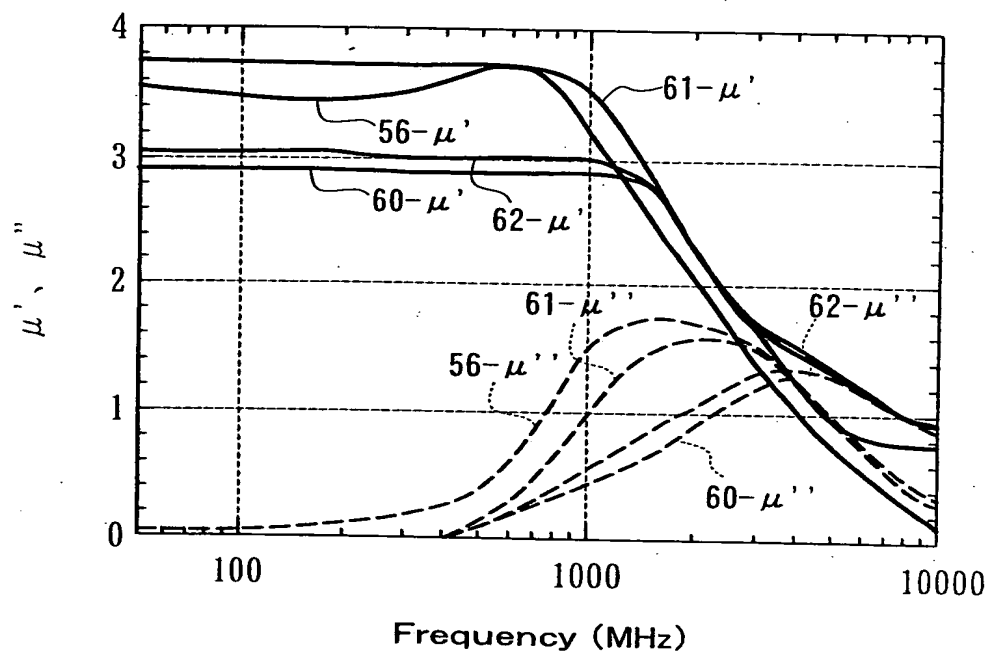
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FIG. 21



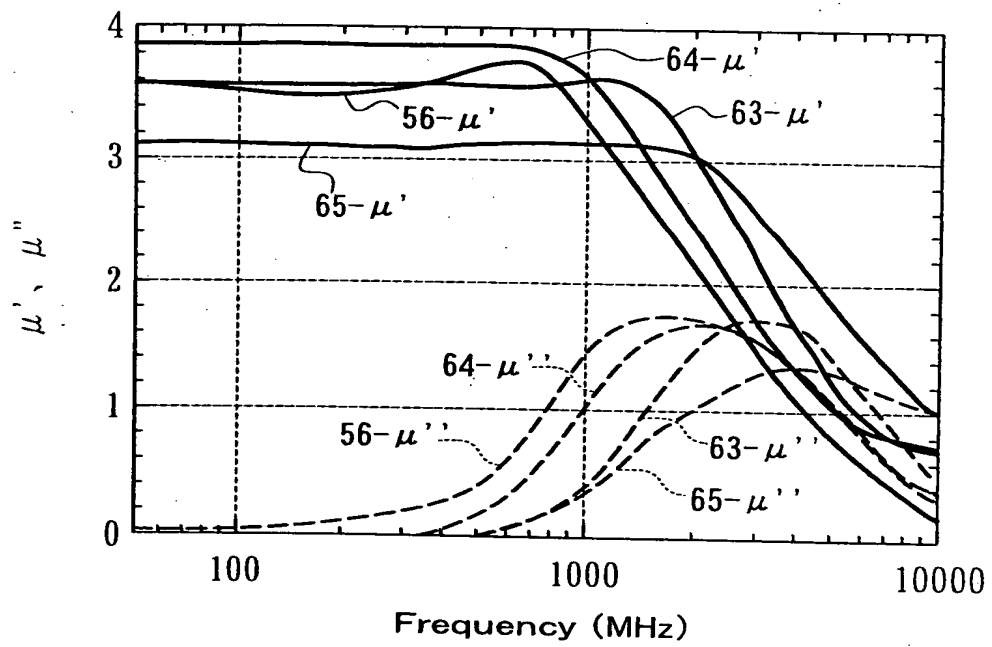
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FIG. 22



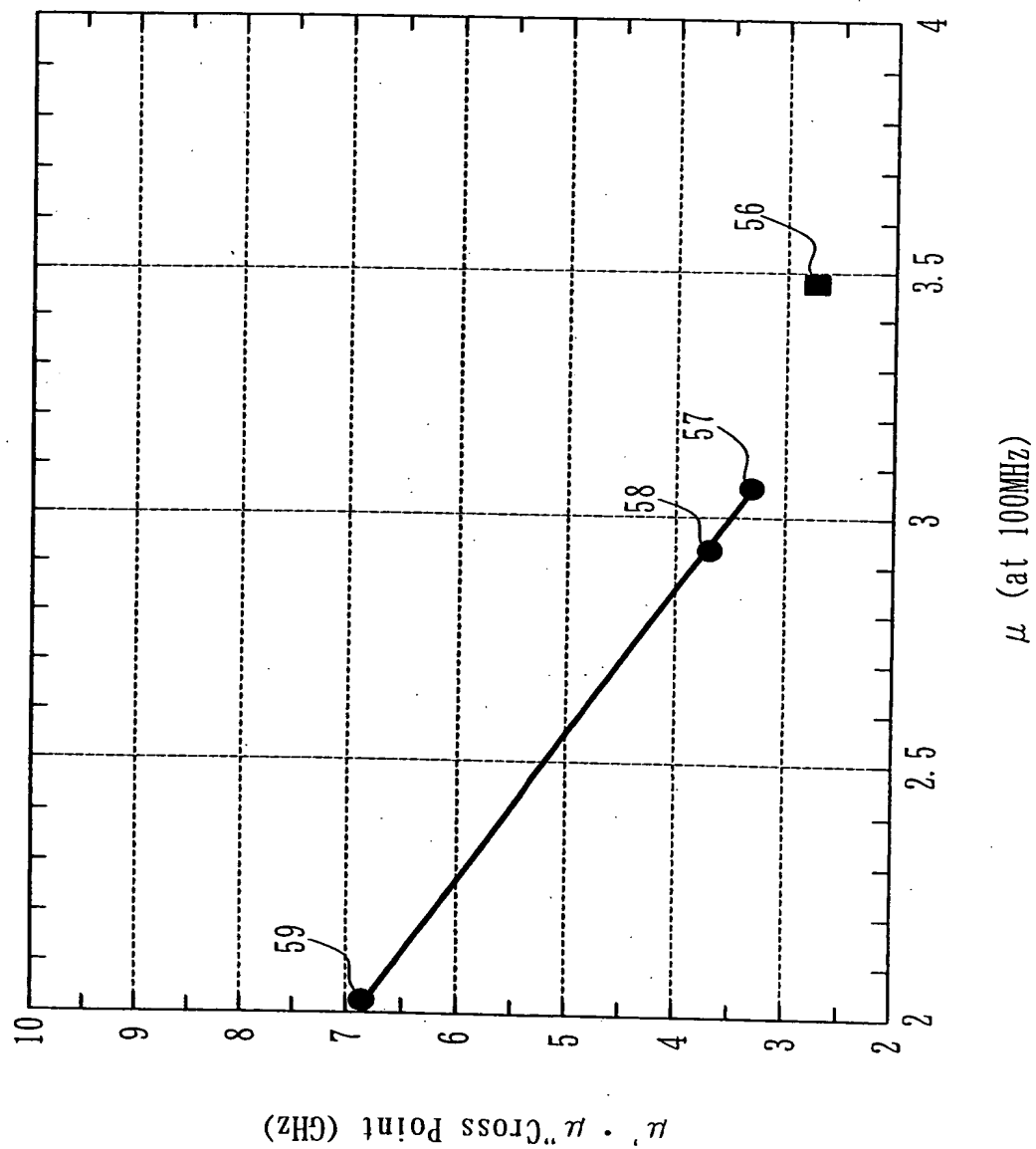
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FIG. 23



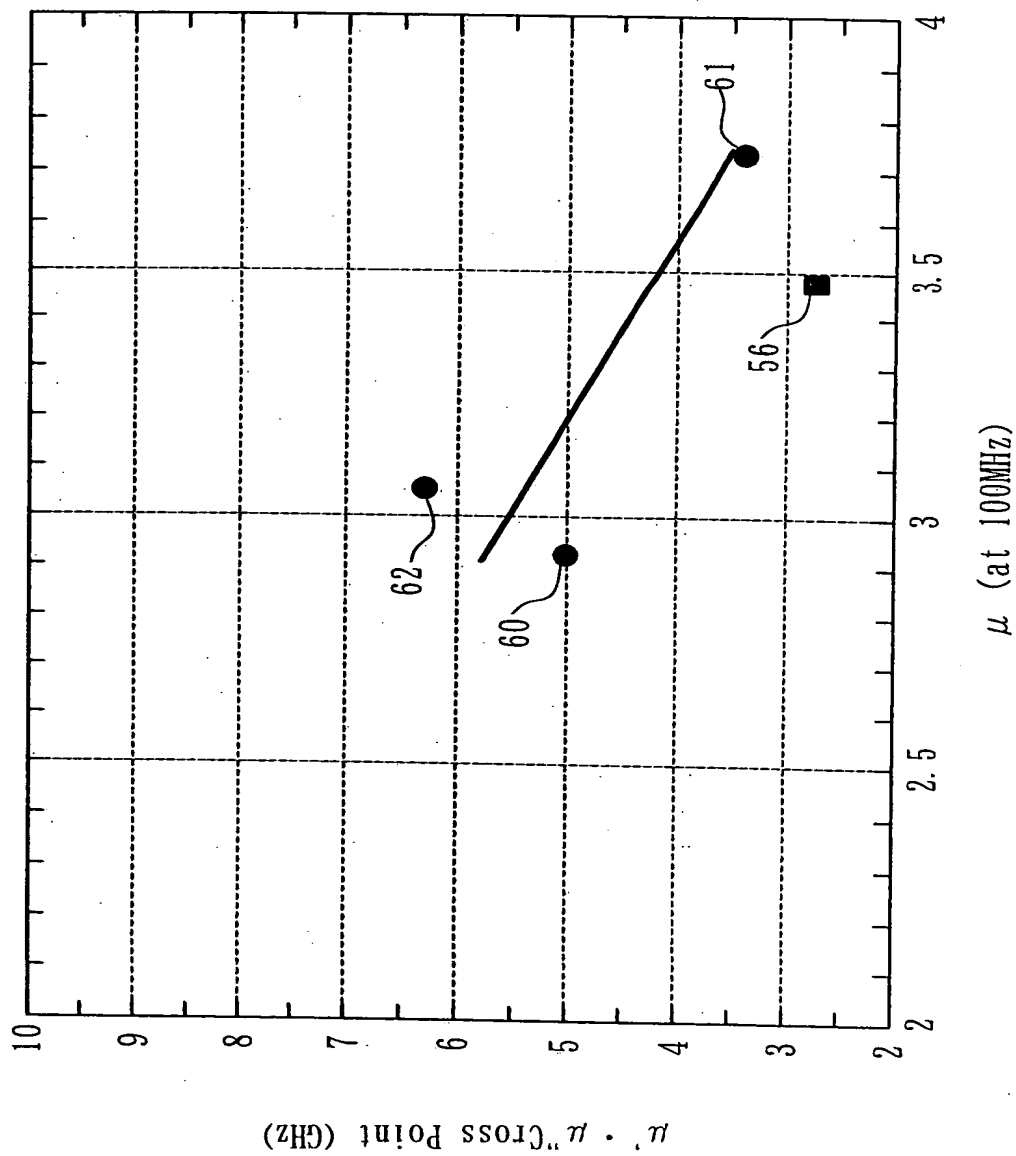
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FIG. 24



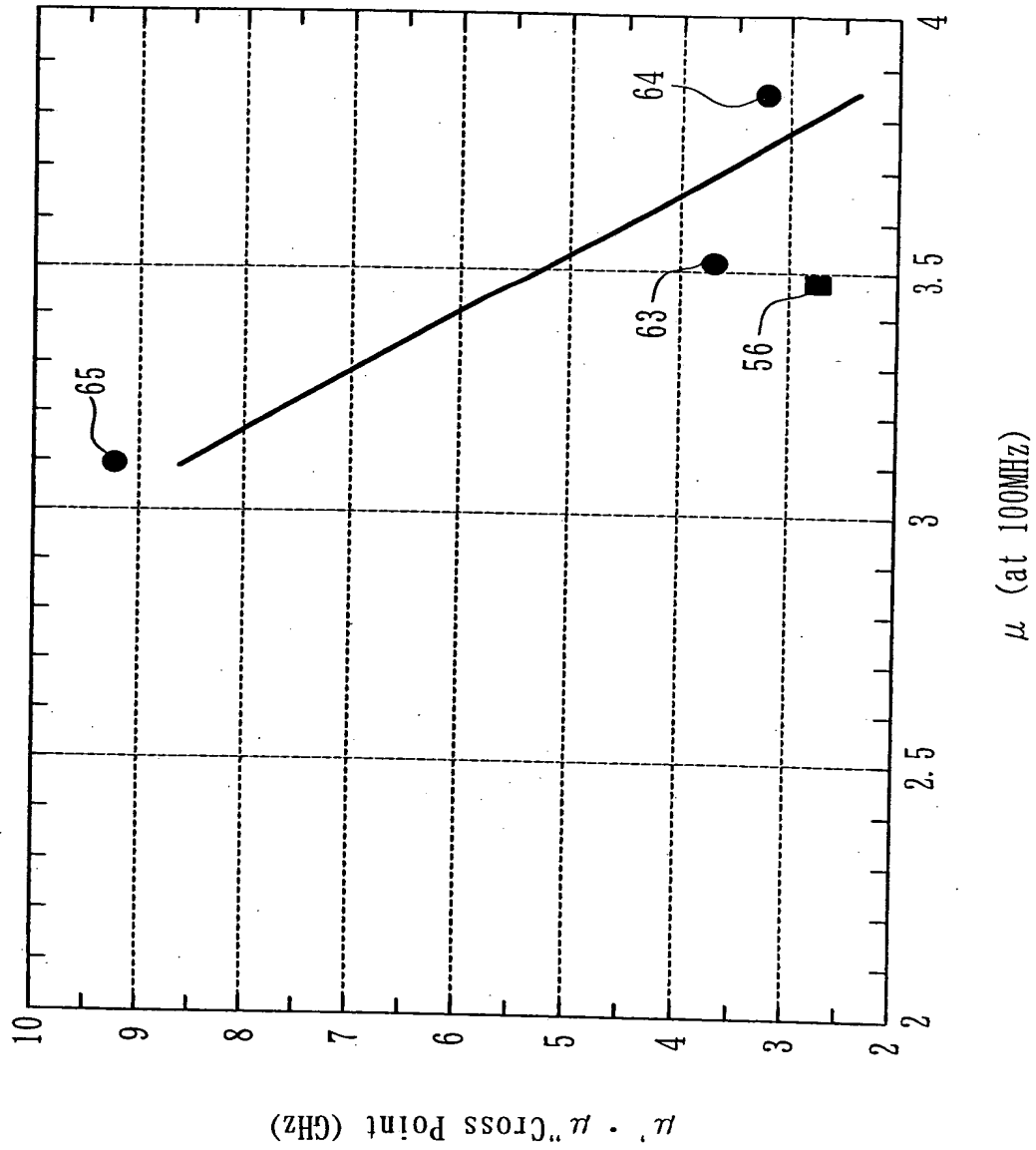
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FIG. 25



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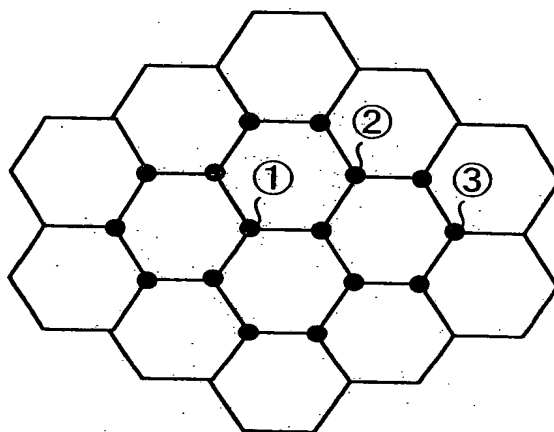
FIG. 26



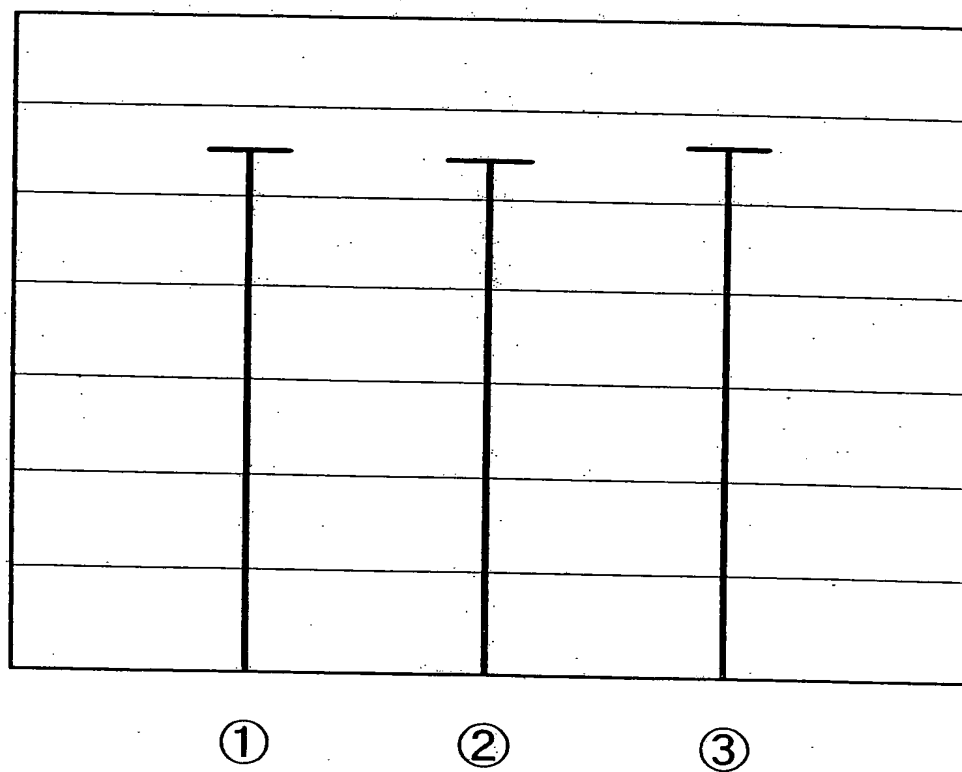
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FIG. 27

(a)



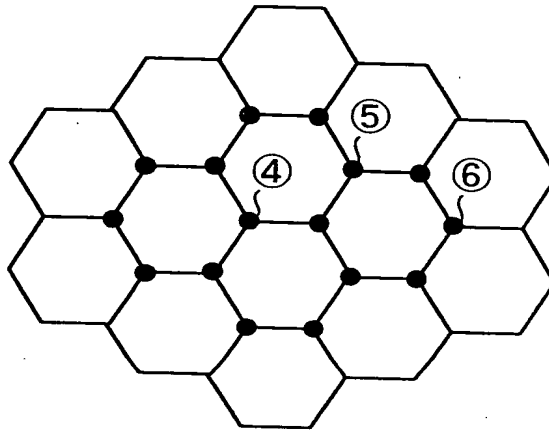
(b)



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FIG. 28

(a)



(b)

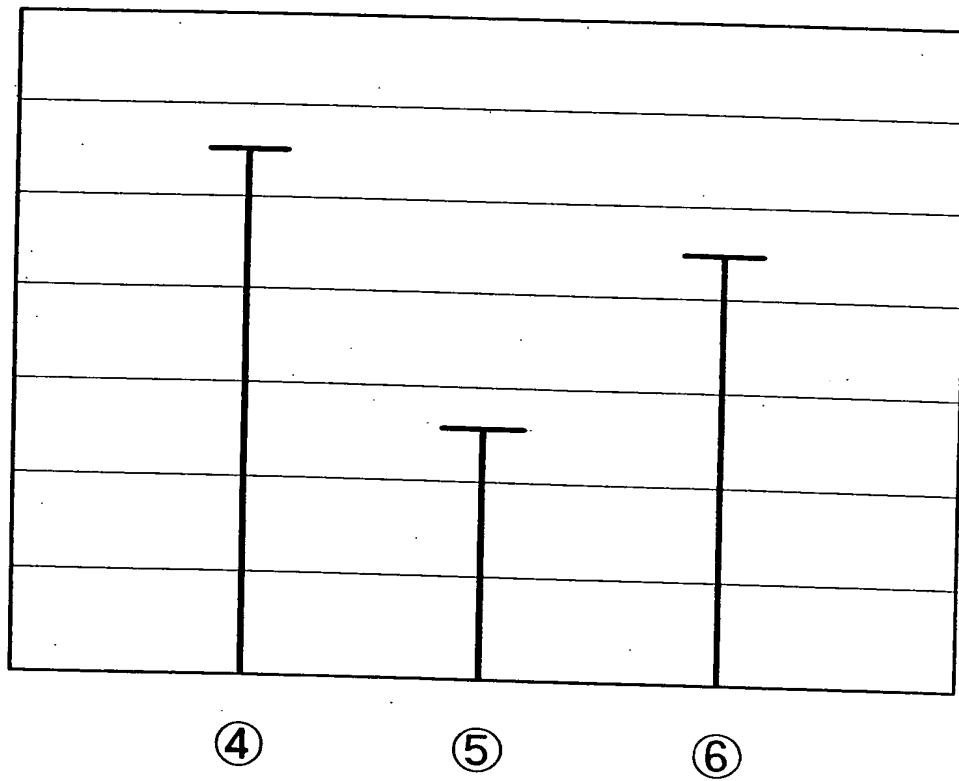
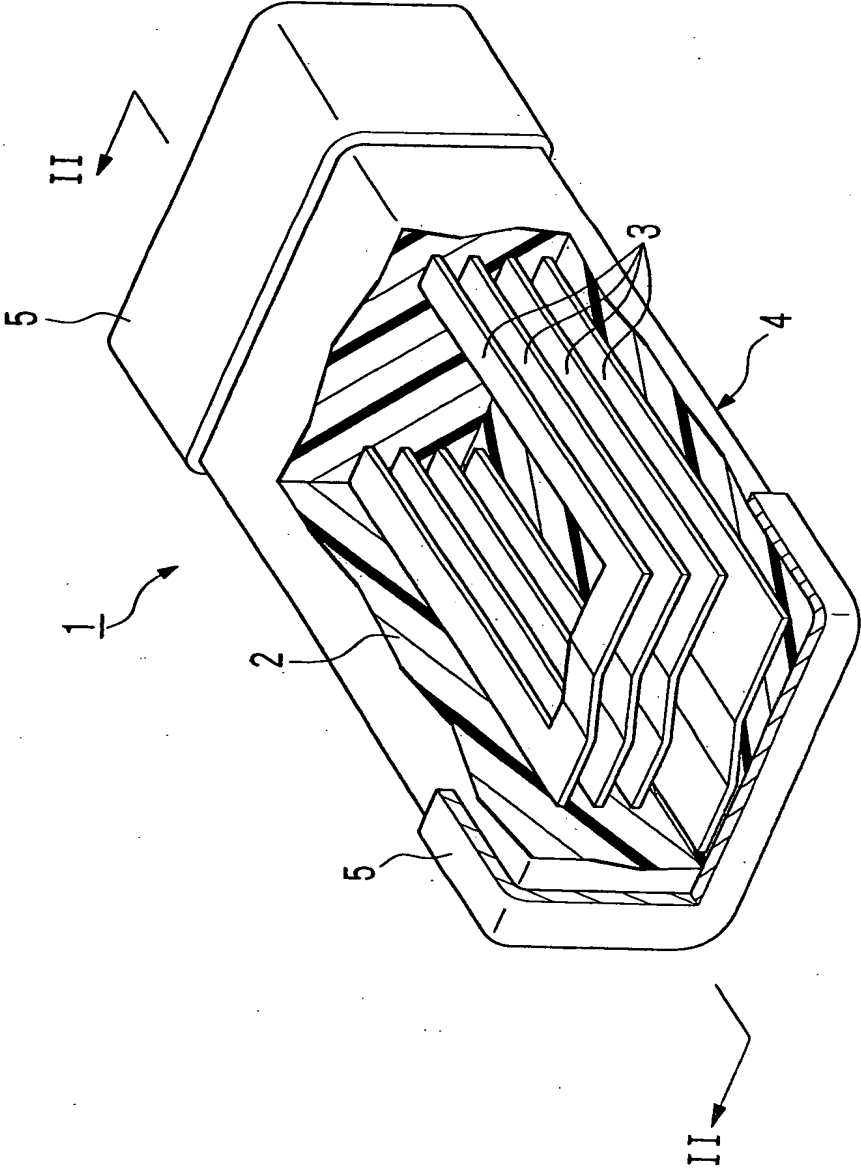
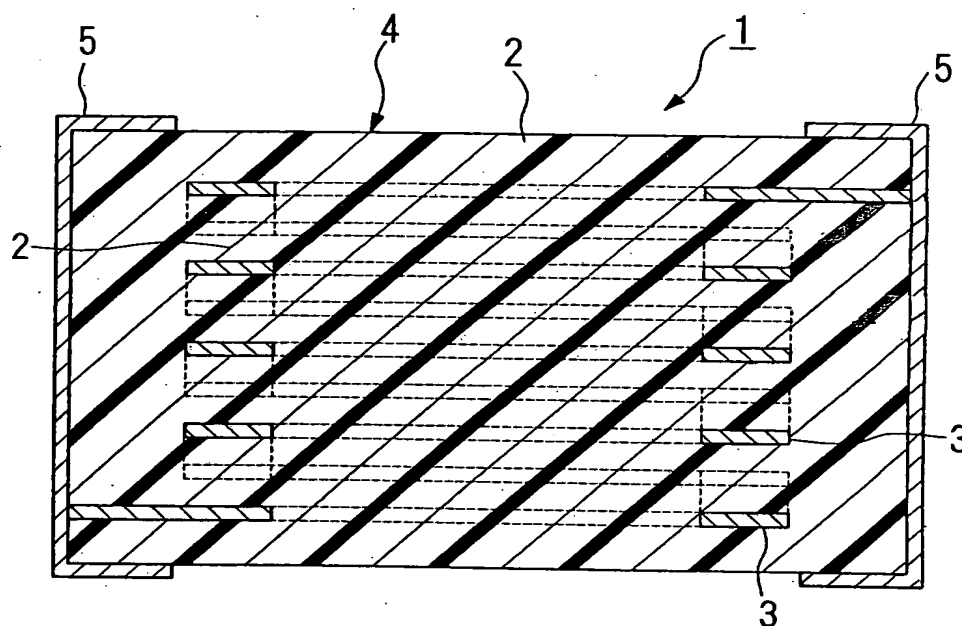


FIG. 29



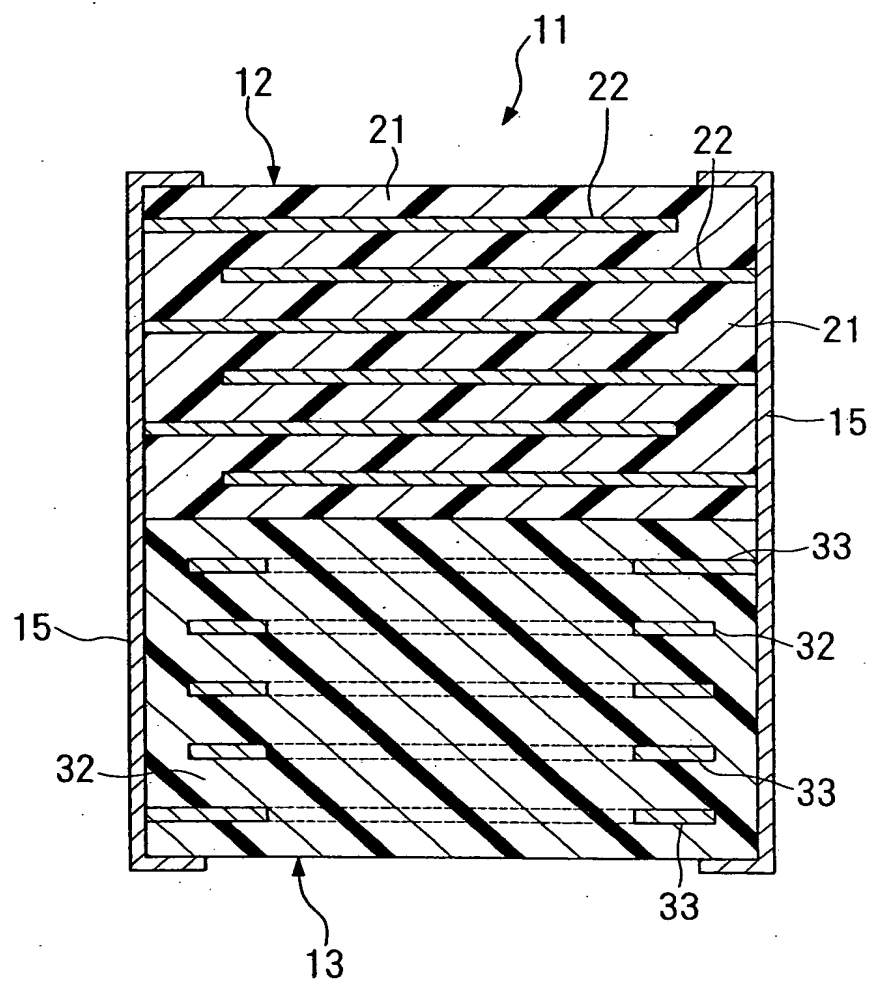
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FIG. 30



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FIG. 31



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FIG.32

Sample No.	Fe ₂ O ₃ (mol%)	BaCO ₃ (mol%)	Co ₃ O ₄ (mol%)	CuO (wt%)	Bi ₂ O ₃ (wt%)	P ak Valu Of Grain Size Distribution	Note
1	68.7	21.035	10.265	—	—	—	Hexagonal Ferrite
2	68.7	21.035	10.265	5.00	5.00	1.0 μ m	Hexagonal Ferrite
3	68.7	21.035	10.265	5.00	5.00	1.65 μ m	Hexagonal Ferrite
4	68.7	21.035	10.265	5.00	5.00	3.3 μ m	Hexagonal Ferrite

FIG.33

Sample No.	Fe ₂ O ₃ (mol%)	NiO (mol%)	CuO (mol%)	ZnO (mol%)	CoO (wt%)	Note
5	48.6	44.9	5.10	1.4	0.2	NiCuZn Ferrite

FIG.34

Raw Material Powder	Specific Surface Area (m ² /g)
Fe ₂ O ₃	5.5
BaCO ₃	10.6
Co ₃ O ₄	12
CuO	6.7
NiO	5
MnO	19
ZnO	5.2
MgO	9.8

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FIG.35

Specific Surface Area (m ² /g)	μ (100MHz)	Sintered Body Density (g/cm ³)	Shrinkage Rate (%)	Smoothness	Use As Paint	Note
1	2.5	4.5	14	×	○	Many Large Grains, Bad Sheet State Condition
5	3.8	4.9	17.3	○	○	
10	3.7	5.18	18.46	○	○	
15	3.7	5.22	18.5	○	○	
20	3.7	5.24	18.6	○	○	
25	3.7	5.25	18.58	○	○	
35	3.7	5.23	18.8	○	×	Paint Becomes Gel

FIG.36

Sample No.	Fe ₂ O ₃ (mol%)	BaCO ₃ (mol%)	Co ₃ O ₄ (mol%)	NiO (mol%)	MnO (mol%)	ZnO (mol%)	MgO (mol%)	CuO (wt%)	Bi ₂ O ₃ (wt%)	Note
6	68.7	21.035	10.162	0.103	—	—	—	5.00	5.00	A Portion Of Co ₃ O ₄ Was Substituted With NiO
7	68.7	21.035	9.752	0.513	—	—	—	5.00	5.00	
8	68.7	21.035	7.699	2.566	—	—	—	5.00	5.00	
9	68.7	21.035	5.133	5.133	—	—	—	5.00	5.00	
10	68.7	21.035	10.162	—	0.103	—	—	5.00	5.00	A Portion Of Co ₃ O ₄ Was Substituted With MnO
11	68.7	21.035	9.752	—	0.513	—	—	5.00	5.00	
12	68.7	21.035	7.699	—	2.566	—	—	5.00	5.00	
13	68.7	21.035	5.133	—	5.133	—	—	5.00	5.00	
14	68.7	21.035	10.162	—	—	0.103	—	5.00	5.00	A Portion Of Co ₃ O ₄ Was Substituted With ZnO
15	68.7	21.035	9.752	—	—	0.513	—	5.00	5.00	
16	68.7	21.035	7.699	—	—	2.566	—	5.00	5.00	
17	68.7	21.035	5.133	—	—	5.133	—	5.00	5.00	
18	68.7	21.035	10.162	—	—	—	0.103	5.00	5.00	A Portion Of Co ₃ O ₄ Was Substituted With MgO
19	68.7	21.035	9.752	—	—	—	0.513	5.00	5.00	
20	68.7	21.035	7.699	—	—	—	2.566	5.00	5.00	
21	68.7	21.035	5.133	—	—	—	5.133	5.00	5.00	

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FIG.37

Sample No.	Fe ₂ O ₃ (mol%)	BaCO ₃ (mol%)	Co ₃ O ₄ (mol%)	CuO (mol%)	Bi ₂ O ₃ (wt%)	CuO (wt%)	Note
22	68.7	21.035	9.752	0.513	5.00	5.00	A Portion Of Co ₃ O ₄ Was Substituted With CuO By 5%
23	68.7	21.035	7.699	2.566	5.00	5.00	A Portion Of Co ₃ O ₄ Was Substituted With CuO By 25%
24	68.7	21.035	5.133	5.133	5.00	5.00	A Portion Of Co ₃ O ₄ Was Substituted With CuO By 50%
25	68.7	21.035	2.566	7.699	5.00	5.00	A Portion Of Co ₃ O ₄ Was Substituted With CuO By 75%

FIG.38

Sample No.	Calcining Temperature (°C)	Sintered Body Density (g/cm ³)	Shrinkage Rate (%)	μ (500MHz)	ϵ (1MHz)
22	1200	5.06	15.46	1.77	40
	1250	5.24	17.96	3.61	38
23	1200	5.01	16.00	1.70	43
	1250	5.24	17.62	2.66	42
24	1200	5.10	16.35	1.80	43
	1250	5.23	17.73	2.03	43
25	1200	5.12	16.46	1.84	45
	1250	—	—	—	—

FIG.39

Sampl No.	Fe ₂ O ₃ (mol%)	BaCO ₃ (mol%)	Co ₃ O ₄ (mol%)	SrCO ₃ (mol%)	Bi ₂ O ₃ (wt%)	CuO (wt%)	Note
26	68.7	20.614	10.162	0.421	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 2%
27	68.7	20.194	10.162	0.841	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 4%
28	68.7	19.352	10.162	1.683	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 8%
29	68.7	17.669	10.162	3.366	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 16%
30	68.7	16.828	10.162	4.207	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 20%
31	68.7	15.776	10.162	5.259	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 25%
32	68.7	13.673	10.162	7.362	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 35%
33	68.7	10.517	10.162	10.517	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 50%
34	68.7	5.259	10.162	15.776	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 75%
35	68.7	0	10.162	21.035	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 100%

FIG.40

Sample No.	Calcining Temperature (°C)	Sintered Body Density (g/cm ³)	Shrinkage Rate (%)	μ' (500MHz)	μ'' (500MHz)
26	1300	5.23	17.04	2.00	0.034
27	1300	5.21	17.00	2.03	0.042
28	1300	5.17	17.00	2.05	0.051
29	1300	4.92	15.85	2.44	0.073
30	1250	4.83	15.38	3.80	0.137
31	1250	4.69	15.01	4.01	0.260
32	1250	3.76	9.74	3.70	0.190
33	1250	2.97	2.62	2.54	0.010
34	1250	2.99	0.85	2.12	0.010
35	1250	—	—	—	—

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FIG.41

Sample No.	Fe ₂ O ₃ (mol%)	BaCO ₃ (mol%)	Co ₃ O ₄ (mol%)	Glass A (wt%)	Glass B (wt%)	Note
36	68.7	21.04	10.27	—	5.00	Glass A: Zinc Borosilicate Glass
37	68.7	21.04	10.27	5.00	—	Glass B: Zinc Borosilicate Glass

FIG.42

	SiO ₂	B ₂ O ₃	ZnO	Al ₂ O ₃	MnO	CoO	Li ₂ O	Na ₂ O	MgO	K ₂ O
Glass A	10.38	44.55	35.65	2.13	—	—	—	7.07	0.19	0.04
Glass B	17.4	10.4	51.5	—	3.50	4.2	13	—	—	—

FIG.43

Sample No.	Fe_2O_3 (mol%)	BaCO_3 (mol%)	Co_3O_4 (mol%)	Bi_2O_3 Based Glass (wt%)			Zinc Borosilicate Glass (wt%)	CuO (wt%)	Bi_2O_3 (wt%)
				Sintering Aid A	Sintering Aid B	Sintering Aid C			
38	68.7	21.035	10.265	3.00	—	—	—	—	—
39	68.7	21.035	10.265	5.00	—	—	—	—	—
40	68.7	21.035	10.265	7.00	—	—	—	—	—
41	68.7	21.035	10.265	9.00	—	—	—	—	—
42	68.7	21.035	10.265	—	3.00	—	—	—	—
43	68.7	21.035	10.265	—	5.00	—	—	—	—
44	68.7	21.035	10.265	—	7.00	—	—	—	—
45	68.7	21.035	10.265	—	—	3.00	—	—	—
46	68.7	21.035	10.265	—	—	5.00	—	—	—
47	68.7	21.035	10.265	—	—	7.00	—	—	—
48	68.7	21.035	10.265	—	—	—	3.00	—	—
49	68.7	21.035	10.265	—	—	—	5.00	—	—
50	68.7	21.035	10.265	—	—	—	7.00	—	—
51	68.7	21.035	10.265	—	—	—	—	3.00	—
52	68.7	21.035	10.265	—	—	—	—	5.00	—
53	68.7	21.035	10.265	—	—	—	—	7.00	—
54	68.7	21.035	10.265	—	—	—	—	—	5.00
55	68.7	21.035	10.265	—	—	—	—	—	10.00
56	68.7	21.035	10.265	—	—	—	—	5.00	5.00

FIG.44

		(wt%)							
		Bi_2O_3	B_2O_3	ZnO	SiO_2	Al_2O_3	Na_2O	MgO	K_2O
Bi_2O_3 Based Glass	Sintering Aid A	83.83	13.75	—	1.94	—	—	—	—
	Sintering Aid B	49.51	19.68	27.51	2.4	0.12	—	—	—
	Sintering Aid C	39.89	19.57	37.3	2.32	0.16	—	—	—
Zinc Borosilicate Glass		—	44.55	35.65	10.38	2.13	7.07	0.19	0.04

FIG.45

Sample No.	Shrinkage Rate (%)	Sintered Body Density (g/cm ³)	Additive					Calcining Temperature (°C)	Sintering Temperature (°C)
			Bi ₂ O ₃ Based Glass			Zinc Borosilicate Glass	CuO		
			Sintering Aid A	Sintering Aid B	Sintering Aid C				
38	14.77	4.50	3wt%	—	—	—	—	1300	930
39	15.96	4.74	5wt%	—	—	—	—	1300	930
40	16.42	4.84	7wt%	—	—	—	—	1300	930
41	16.50	4.88	9wt%	—	—	—	—	1300	930
42	11.89	4.22	—	3wt%	—	—	—	1300	930
43	13.39	4.42	—	5wt%	—	—	—	1300	930
44	14.04	4.53	—	7wt%	—	—	—	1300	930
45	11.15	4.18	—	—	3wt%	—	—	1300	930
46	12.66	4.37	—	—	5wt%	—	—	1300	930
47	13.38	4.39	—	—	7wt%	—	—	1300	930
48	12.30	4.49	—	—	—	3wt%	—	1300	950
49	13.10	4.40	—	—	—	5wt%	—	1300	950
50	14.12	4.35	—	—	—	7wt%	—	1300	950

FIG.46

Sample No.	Relative Resistivity ($M\Omega \cdot cm$)	Bi ₂ O ₃ Based Glass (wt%)			CuO (wt%)	Bi ₂ O ₃ (wt%)
		Sintering Aid A	Sintering Aid B	Sintering Aid C		
38	360	3.00	—	—	—	—
39	770	5.00	—	—	—	—
40	940	7.00	—	—	—	—
41	840	9.00	—	—	—	—
42	75	—	3.00	—	—	—
43	310	—	5.00	—	—	—
44	910	—	7.00	—	—	—
45	51	—	—	3.00	—	—
46	140	—	—	5.00	—	—
47	310	—	—	7.00	—	—
51	51	—	—	—	3.00	—
52	37	—	—	—	5.00	—
53	18	—	—	—	7.00	—
54	21	—	—	—	—	5.00
55	18	—	—	—	—	10.00
56	24	—	—	—	5.00	5.00

FIG.47

Sample No.	Fe ₂ O ₃ (mol%)	BaCO ₃ (mol%)	Co ₃ O ₄ (mol%)	Additive			Note
				Bi ₂ O ₃ Based Glass (wt%)	CuO (wt%)	Zinc Borosilicate Glass (wt%)	
38	68.7	21.035	10.265	3.00	—	—	Sintering Aid A
39	68.7	21.035	10.265	5.00	—	—	
40	68.7	21.035	10.265	7.00	—	—	
57	68.7	21.035	10.265	3.00	3.00	—	
58	68.7	21.035	10.265	5.00	5.00	—	
59	68.7	21.035	10.265	7.00	7.00	—	
42	68.7	21.035	10.265	3.00	—	—	Sintering Aid B
43	68.7	21.035	10.265	5.00	—	—	
44	68.7	21.035	10.265	7.00	—	—	
60	68.7	21.035	10.265	3.00	3.00	—	
61	68.7	21.035	10.265	5.00	5.00	—	
62	68.7	21.035	10.265	7.00	7.00	—	
45	68.7	21.035	10.265	3.00	—	—	Sintering Aid C
46	68.7	21.035	10.265	5.00	—	—	
47	68.7	21.035	10.265	7.00	—	—	
63	68.7	21.035	10.265	3.00	3.00	—	
64	68.7	21.035	10.265	5.00	5.00	—	
65	68.7	21.035	10.265	7.00	7.00	—	
48	68.7	21.035	10.265	—	—	3.00	Comparative Example
49	68.7	21.035	10.265	—	—	5.00	
50	68.7	21.035	10.265	—	—	7.00	

FIG.48

Sample No.	Shrinkage Rate (%)	Sintered Body Density (g/cm ³)	μ' (500MHz)	μ'' (500MHz)	Additive			
					CuO (wt%)	Sintering Aid A (wt%)	Sintering Aid B (wt%)	Sintering Aid C (wt%)
38	14.77	4.50	2.67	0.05	—	3.0	—	—
39	15.96	4.74	2.52	0.04	—	5.0	—	—
40	16.42	4.84	2.25	0.03	—	7.0	—	—
57	15.92	4.77	3.12	0.08	3.0	3.0	—	—
58	16.77	4.92	3.08	0.08	5.0	5.0	—	—
59	16.69	4.91	1.92	0.03	7.0	7.0	—	—
42	11.89	4.22	3.37	0.03	—	—	3.0	—
43	13.39	4.42	3.60	0.04	—	—	5.0	—
44	14.04	4.53	3.37	0.04	—	—	7.0	—
60	14.12	4.52	3.47	0.15	3.0	—	3.0	—
61	15.81	4.79	3.80	0.39	5.0	—	5.0	—
62	16.31	4.87	2.72	0.17	7.0	—	7.0	—
45	11.15	4.18	3.46	0.02	—	—	—	3.0
46	12.66	4.37	3.81	0.09	—	—	—	5.0
47	13.38	4.39	3.43	0.07	—	—	—	7.0
63	13.50	4.46	3.55	0.18	3.0	—	—	3.0
64	15.23	4.70	3.88	0.42	5.0	—	—	5.0
65	15.54	4.73	2.88	0.223	7.0	—	—	7.0

FIG.49

Sample No.	Permittivity ϵ	Bi ₂ O ₃ Based Glass (wt%)			CuO (wt%)	Bi ₂ O ₃ (wt%)
		Sintering Aid A	Sintering Aid B	Sintering Aid C		
38	27	3.0	—	—	—	—
39	30	5.0	—	—	—	—
40	28	7.0	—	—	—	—
57	31	3.0	—	—	3.0	—
58	31	5.0	—	—	5.0	—
59	30	7.0	—	—	7.0	—
42	22	—	3.0		—	—
43	25	—	5.0		—	—
44	23	—	7.0		—	—
60	26	—	3.0		3.0	—
61	27	—	5.0		5.0	—
62	27	—	7.0		7.0	—
45	21	—	—	3.0	—	—
46	24	—	—	5.0	—	—
47	24	—	—	7.0	—	—
63	25	—	—	3.0	3.0	—
64	26	—	—	5.0	5.0	—
65	26	—	—	7.0	7.0	—
56	40	—	—	—	5.0	5.0